ANACONDA Minerals Co any
New Mexico Opere tions
P.O. Box 638
Grants, New Mexico 87020
Telephone 505 876 2211

July 23, 1982

Mr. George Tetreault
Minerals Management Service
Federal Building, Room 116
500 Gold Avenue, S.W.
Albuquerque, New Mexico 87102

ROUTE

Date		Surname
Dist. Supv.		
M ning Eng.		
Mining Eng.		
Min'ng Eng.		
Env. Sci en.		
Geologist		
Secretary		

Note: _____

Dear George:

Enclosed is a draft copy of a memorandum titled
Main Tailing Area, Contained Pounds U308; Origins and
Proportions Emplaced Before and After January 1, 1976,
addressed to Mr. R. D. Lynn from Corwin, Romero, and
me, dated July 7, 1982.

If you have any questions regarding this
memorandum, please let me know.

Sincerely,

Z. E. Arlin

cc: R.D. Lynn
    C.D. Corwin
    F. Romero
    C.C. Howard

Date:　　　July 7, 1982

Subject:　　MAIN TAILING AREA, CONTAINED POUNDS U_3O_8; ORIGINS AND
　　　　　　　PROPORTIONS EMPLACED BEFORE AND AFTER JANUARY

From/Location:　Z. E. Arlin, C. D. Corwin, F. Romero

To/Location:　　R. D. Lynn

The Main Tailing Area now contains a total of about 8,210,359 pounds of U_3O_8, of which an estimated 56.4460% are residual from placement prior to 1976 and 43.5540% are residual from placement after 1975.

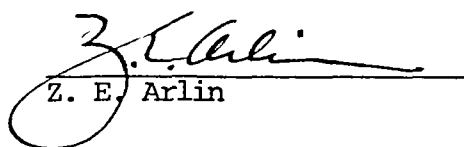The total pounds U_3O_8 discharged to the Main Tailing Area and the subsequent losses are presented below:

DRAFT

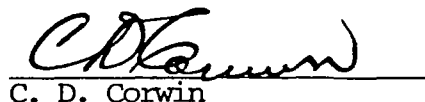|	POUNDS U3O8		
	1956-1975	1976-1982	TOTAL
TOTAL POUNDS DISCHARGED TO MAIN AREA.[1]			
Pounds from Laguna ores	4,969,111	3,830,287	8,799,398
Pounds from non-Laguna ores	232,251	0	232,251
Total pounds discharged	5,201,362	3,830,287	9,031,649
LESS: Pounds lost by seepage	393,990	21,472	415,462
Pounds injected into disposal well	172,950	18,150	191,100
Pounds pumped to evaporation ponds	0	214,728	214,728
Total pounds output	566,940	254,350	821,290
TOTAL POUNDS REMAINING IN MAIN AREA			
Pounds from Laguna ores	4,427,486	3,575,937	8,003,423
Pounds from non-Laguna ores	206,936	0	206,936
Total pounds remaining	4,634,422	3,575,937	8,210,359
PROPORTIONS OF POUNDS REMAINING			
Pounds from Laguna ores	53.9256 %	43.5540 %	97.4796 %
Pounds from non-Laguna ores	2.5204 %	0.0000 %	2.5204 %
TOTAL PROPORTIONS PER PERIOD =	56.4460 %	43.5540 %	100.0000 %

1　The Main Tailing Area received mill tailings beginning January 3, 1956 through the termination of milling in the first quarter of 1982.
　　January 1, 1976 was the commencement of the payment of the Bonus Royalty.

Supporting data for the above information is attached.

All of the supporting data is related only to the discharge of mill tailings to the Main Pond Area.

Respectfully,

Z. E. Arlin　　　　　C. D. Corwin　　　　　F. Romero

INDEX TO SUPPORTING DATA

To accompany Internal Memorandum "Main Tailing Area, Contained
Pounds U3O8," July 7, 1982.

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A.1. ANNUAL POUNDS U$_3$O$_8$ ACCOUNTING*

YEAR	TOTAL POUNDS TO TREATMENT	TOTAL POUNDS PRODUCED	TOTAL POUNDS TO MAIN TAILING AREA	
			FROM LAGUNA ORES	FROM NON-LAGUNA ORES
1956	5,538,546.65	4,975,120.61	492,309.41	71,116.63
1957	4,740,769.45	4,288,989.65	372,735.10	79,044.70
1958	5,238,058.82	4,712,894.85	459,829.52	65,334.45
1959	3,922,854.27	3,615,619.03	290,479.87	16,755.37
1960	3,439,811.72	3,167,541.82	272,269.90	0
1961	3,190,443.12	2,984,909.02	205,534.10	0
1962	2,474,866.80	2,375,704.58	99,162.22	0
1963	1,584,302.91	1,470,067.40	114,235.51	0
1964	1,616,380.27	1,510,046.84	106,333.43	0
1965	1,603,353.16	1,546,006.07	57,347.09	0
1966	1,569,708.45	1,520,660.48	49,047.97	0
1967	1,581,327.68	1,532,364.88	48,962.80	0
1968	3,282,527.99	3,134,546.00	147,981.99	0
1969	3,151,331.50	3,042,563.68	108,767.82	0
1970	3,707,753.07	3,534,297.85	173,455.22	0
1971	3,813,538.09	3,525,086.75	288,451.34	0
1972	4,423,284.92	4,044,375.74	378,909.18	0
1973	4,645,629.57	4,113,482.89	532,146.68	0
1974	3,408,820.43	3,029,965.30	378,855.13	0
1975	3,521,193.89	3,128,897.50	392,296.39	0
Sub	66,454,502.76	61,253,140.94	4,969,110.67	232,251.15
1976	3,545,870.16	3,100,045.52	445,824.64	0
1977	3,138,718.43	2,504,076.00	634,642.43	0
1978	5,340,189.65	4,386,810.00	953,379.65	0
1979	4,077,574.65	3,502,236.00	575,338.65	0
1980	4,513,649.70	3,944,183.00	569,466.70	0
1981	3,402,780.78	2,823,684.00	579,096.78	0
1982	582,704.92	510,167.00	72,537.92	0
Sub	24,601,488.29	20,771,201.52	3,830,286.77	0
Grand	91,055,991.05	82,024,342.46	8,799,397.44	232,251.15

* Compiled from Metallurgical Accounting records.

B.1. SUMMARY: POUNDS OF U_3O_8 LOST BY SEEPAGE FROM MAIN TAILING AREA

DRAFT ANACONDA
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	1956 - 1975	1976 - 1982	TOTALS
Total pounds U_3O_8 to tails[1]	5,201,362	3,830,287	9,031,649
Proportion soluble U_3O_8[2]	25.0000 %	25.1208 %	25.0512 %
Soluble pounds U_3O_8	1,300,341	962,199	2,262,540
Total gallons water to tails[3]	10,128,990,000	4,781,364,000	14,910,354,000
Soluble pounds U_3O_8 per gallon	128.378×10^{-6}	201.239×10^{-6}	151.743×10^{-6}
Seepage loss, gallons[4]	3,068,978,400	106,696,800	3,175,675,200
Seepage loss, pounds U_3O_8	393,990	21,472	415,462

1 From PAGE A.1.
2 From PAGE B.2.
3 From PAGE B.5.
4 From PAGE B.3.

B.2. TAILING ASSAYS: U_3O_8, TOTAL AND INSOLUBLE*

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YEAR	ACID MILL			CARBONATE MILL		
	TONS (DST)	TOTAL % U3O8	INSOL. % U3O8	TONS (DST)	TOTAL % U3O8	INSOL. % U3O8
1956	754,677	0.0260	0.0191	267,314	0.0366	0.0272
1957	791,138	0.0188	0.0144	298,211	0.0384	0.0288
1958	979,329	0.0207	0.0165	300,173	0.0345	0.0294
1959	924,253	0.0163	0.0132	82,589	0.0321	0.0276
1960	888,891	0.0162	0.0131	0		
1961	858,240	0.0168	0.0139	0		
1962	528,695	0.0161	0.0122	0		
1963	370,001	0.0165	0.0126	0		
1964	340,099	0.0167	0.0123	0		
1965	240,999	0.0144	0.0118	0		
1966	223,642	0.0116	0.0090	0		
1967	235,394	0.0118	0.0095	0		
1968	511,328	0.0136	0.0102	0		
1969	497,560	0.0120	0.0083	0		
1970	571,583	0.0142	0.0075	0		
1971	578,527	0.0210	0.0112	0		
1972	692,062	0.0329	0.0216	0		
1973	822,000	0.0398	0.0288	0		
1974	778,480	0.0338	0.0265	0		
1975	750,349	0.0344	0.0267	0		
Sub	12,337,247	0.0218	0.0162	948,287	0.0361	0.0285
1976	690,012	0.0430	0.0282	0		
1977	696,084	0.0480	0.0328	0		
1978	1,798,311	0.0253	0.0196	0		
1979	2,210,944	0.0185	0.0154	0		
1980	2,402,881	0.0163	0.0121	0		
1981	2,406,922	0.0108	0.0080	0		
1982	296,040	0.0108	0.0080	0		
Sub	10,501,194	0.0207	0.0155	0		
Grand	23,786,728	0.0213	0.0158	948,287	0.0361	0.0285

1956-1975 ACID MILL. (0.0218 - 0.0162) ÷ 0.0218 = 25.6881 % Soluble of Total U3O8
CARB MILL: (0.0361 - 0.0285) ÷ 0.0361 = 21.0526 % Soluble of Total U3O8
COMBINED: (0.0228 - 0.0171) ÷ 0.0228 = 25.0000 % Soluble of Total U3O8
1976-1982 ACID MILL: (0.0207 - 0.0155) ÷ 0.0207 = 25.1208 % Soluble of Total U3O8

* Compiled from monthly mill operations reports.

B.3. SEEPAGE LOSSES FROM MAIN TAILING AREA IN GALLONS PER MINUTE*

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL AVERAGE
1956	-	-	-	-	-	-	-	-	-	-	-	-	1,717
1957	-	-	-	-	-	-	-	-	-	-	-	-	1,350 est.
1958	1,116	933	-	-	-	-	-	-	-	-	-	-	1,000
1959	-	-	-	-	-	-	-	-	-	-	-	-	700 est.
1960	-	-	43	150	126	-	-	-	-	-	-	-	400 est.
1961	-	-	-	11	35	76	138	70	129	178	292	269	133
1962	222	239	199	185	76	75	38	51	86	74	90	82	110
1963	130	26	108	88	84	77	45	98	59	87	114	11	78
1964	34	26	53	78	24	13	9	30	90	5	5	3	31
1965	2	57	36	13	2	2	20	87	75	93	40	35	38
1966	42	37	80	5	10	7	6	4	3	10	5	3	18
1967	10	2	4	5	1	1	6	6	2	4	2	1	4
1968	2	3	3	3	3	3	5	3	2	5	4	5	3
1969	4	8	32	2	5	3	3	3	3	4	5	4	6
1970	4	3	3	1	4	2	2	4	4	3	5	3	3
1971	3	4	4	3	2	5	4	2	2	3	3	1	3
1972	2	4	2	2	3	5	3	5	5	3	373	104	43
1973	25	53	274	58	55	100	27	37	29	35	36	518	104
1974	245	360	24	46	8	2	13	11	12	131	70	2	77
1975	168	5	2	1	2	1	15	5	8	1	16	22	21
													5,839
1976	7	16	1	4	4	7	43	47	22	45	19	84	25
1977	6	6	12	29	51	23	-	-	-	-	-	-	25 est.
1978	-	-	-	-	-	-	-	-	-	-	-	-	30 est.
1979	-	-	-	-	-	-	-	-	-	-	-	-	35 est.
1980	-	-	-	-	-	-	-	-	-	-	-	-	40
1981	-	-	-	-	-	-	-	-	-	-	-	-	40 est.
1982	-	-	-	(76 days @ 40 gpm = 8 gpm annualized)									8 est.
													203

1956 - 1975: 5,839 GPM total x 525,600 min/yr = 3,068,978,400 gallons.

1976 - 1982: 203 GPM total x 525,600 min/yr = 106,696,800 gallons.

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* 1956 estimated PAGE B.4.; 1958 estimated PAGE B.5.; 1961-1976 from monthly water balance reports; 1980 from report to State Engineer PAGES B.6,7.; remaining estimates proportioned.

B.4. <u>1956 SEEPAGE LOSS CALCULATION</u>

	GALLONS	GPM
CREDIT		
Water discharged to tails	1,216,169,000	2,320
Precipitation[1]	12,675,000	24
Totals	1,203,494,000	2,296
DEBIT		
Water retained in solids[2] (5% moisture in 1,021,991 tons)	12,258,000	23
Evaporation[1]	134,849,000	257
Pond volume change[3] (estimated 5 ft. deep)	157,275,000	299
Totals	304,382,000	579
DIFFERENCE AS SEEPAGE LOSS	899,112,000	1,717

1 From averages of millsite observations for the years 1957 - 1974: annual precipitation = 8.3 inches; annual evaporation = 88.3 inches.

2 From "A Study of Seepage Loss from the Mill Tailing Area..." compiled 6/21/61.

3 Pond areas from "A Study..." and measured from maps:

1/03/56	0	square feet
7/21/56	3,156,300	square feet
11/08/56	4,265,200	square feet
AVERAGE	2,450,000	square feet

The Anaconda Company
New Mexico Operations
Geological Department

June 21, 1961

SUBJECT: A Study of Seepage Loss from the Mill Tailing Area and an
Evaluation of the Adequacy of the Disposal Well.

TO : Mr. A. J. Fitch, Manager

FROM : Z. E. Arlin, Geologist

ANACONDA
CONFIDENTIAL

OBJECTIVES:

1. The determination of the magnitude of seepage loss
of waste water from the mill tailing area.

2. An evaluation of the adequacy of the disposal well.

CONCLUSIONS:

1. Seepage loss of waste water from the mill tailing
area has decreased from a rate of about 1,000 gallons per minute (GPM)
in early 1958 to about 100 GPM in early 1961. This decrease is
attributed to the sealing effect of slimes which are accumulating on
seepage surfaces, and to the reduction in size of the tailing pond by
use of the disposal well. A probable reduction in mill discharge on
April 1, 1962 may permit the permanent maintainance of a smaller pond
and an ultimate reduction of seepage loss to about 50 GPM.

2. At the present rate of mill discharge, the disposal
well can contain the pond within the main tailing area through the
summer of 1962 if overflow is prevented at the low parts of the west
side dike during the winter of 1961-62. This is predicated on an
estimated minimum total rise in pond level of 4 feet during the winter
of 1961-62, which in turn assumes an average disposal well injection rate
of 400 GPM and a normal seasonal climate.

If the present rate of mill discharge is reduced by
about 50%, it is estimated that the disposal well can contain the pond
within the main tailing area until the storage capacity of that area is
exhausted, or for at least six years, whichever occurs the sooner.

If no reduction in mill discharge is made in 1962,
serious consideration should be given to the construction of a second
disposal well before the winter of 1962-63. During that winter, reduced
well and pond capacities and lessened evaporation loss may cause the
main pond to overflow into adjacent tailing areas that are susceptible
to high rates of seepage loss during their initial stages of flooding.

- 1 -

CONFIDENTIAL3 SEEPAGE LOSS   POL-EPA01-0006536

A STUDY OF THE USES OF DIVERSIONARY

WATER AT ANACONDA'S BLUEWATER MILL

Submitted To

New Mexico State Engineer

By

BLUEWATER PLANT ENGINEERING DEPARTMENT

August 27, 1980

TABLE A3 - a

WATER BALANCE - TAILINGS POND (TOTAL WATER)
(COMPILED FOR 1980)

CREDIT:	GALLONS	GPM	ACRE FT.
Mill Discharge	973,936,800	1853	2988.9
Precipitation	48,880,800	93	150.1
Power House Disposal Pond	14,191,200	27	43.5
TOTAL CREDIT	1,037,008,800	1973	3182.5

DEBIT:	GALLONS	GPM	ACRE FT.
Evaporation	132,451,200	252	406.5
Retained in Solids	176,076,000	335	540.4
To Evaporation Ponds	707,457,600	1346	2171.1
Seepage	21,024,000	40	64.5
TOTAL DEBIT	1,037,008,800	1973	3182.5

TABLE A3 - b

WATER BALANCE - TAILINGS POND (NEW WATER) - 1979

CREDIT:			
Mill Discharge	883,533,600	1681	2711.5

DEBIT:			
Evaporation	113,529,600	216	348.4
Retained in Solids	149,796,000	285	459.7
To Evaporation Ponds	602,337,600	1146	1848.5
Seepage	17,870,400	34	54.9
TOTAL DEBIT	883,533,600	1681	2711.5

B.5. ANNUAL TONS OF ORE PROCESSED AND GALLONS OF WATER
      DISCHARGED TO THE MAIN TAILING AREA*

YEAR	TONS PROCESSED	TAILING % SOLIDS	SLURRY Sp. Gr.	GAL/TON	TOTAL GALLONS
1956	1,021,991	16.77	1.118	1,190	1,216,169,000
1957	1,089,349	17.19	1.124	1,156	1,259,287,000
1958	1,279,502	23.90	1.173	764	977,540,000
1959	1,006,842	28.48	1.219	602	606,119,000
1960	888,891	29.88	1.231	563	500,446,000
1961	858,240	-	-	560	481,028,000
1962	528,695	-	-	628	331,833,000
1963	370,001	-	-	756	279,581,000
1964	340,099	-	-	711	241,925,000
1965	240,999	-	-	635	153,088,000
1966	223,642	-	-	673	150,602,000
1967	235,394	-	-	668	157,290,000
1968	511,328	-	-	652	333,574,000
1969	497,560	-	-	717	356,722,000
1970	571,583	-	-	763	436,157,000
1971	578,527	-	-	805	465,643,000
1972	692,062	-	-	754	522,027,000
1973	822,000	-	-	740	608,437,000
1974	778,480	-	-	696	542,188,000
1975	750,349	-	-	679	509,334,000
Sub	13,285,534	-	-	762**	10,128,990,000
1976	690,012	-	-	729	503,333,000
1977	696,084	-	-	841	585,647,000
1978	1,798,311	-	-	405	728,316,000
1979	2,210,944	-	-	405	895,432,000
1980	2,402,881	-	-	405+	973,937,000
1981	2,406,922	-	-	405	974,803,000
1982	296,040	-	-	405	119,896,000
Sub	10,501,194	-	-	455**	4,781,364,000
Grand	23,786,728	-	-	627**	14,910,354,000

* Information compiled from the following sources:

    1956 - 1960: Calculated from tailing slurry sampling reports.
    1961 - 1977: From disposal well reports to E.I.D. and U.S.G.S.
    1978 - 1982: Based on 1980 data from report to NM State Engineer,
                  "A Study of...Water at Anaconda's Bluewater Mill,"
                  dated August 27, 1980; see PAGE B.6,7. Other
                  years estimated on the basis of 1980.

** Averages.

C.1. URANIUM INJECTED INTO THE DISPOSAL WELL*

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U natural	GALLONS INJECTED	POUNDS U_3O_8**
Cumulative 1/20/60 through 6/30/72:		
23.70 curies	846,028,228	110,480
1972 7/1/72 through 12/31/72:		
1.48 uc/ml x 10^{-5}	26,134,895	6,840
1973 1.46 uc/ml x 10^{-5}	100,630,115	25,920
1974 0.896 uc/ml x 10^{-5}	83,206,100	13,130
1975 1.11 uc/ml x 10^{-5}	84,720,575	16,580
Subtotals	1,140,719,913	172,950
1976 1.32 uc/ml x 10^{-5}	31,487,470	7,330
1977 2.23 uc/ml x 10^{-5}	27,596,480	10,820
Subtotals	59,083,950	18,150
Grand totals	1,199,803,863	191,100

* Compiled from reports to the E.I.D. and U.S.G.S.

** Calculated at a Specific Activity of 6.77 x 10^{-7} curies
     per gram U. See PAGE C.2,3,4.

INTERNAL CORRESPONDENCE

DATE: June 24, 1982

SUBJECT: U-NAT. CALCULATIONS

FROM: Levi C. Leyba

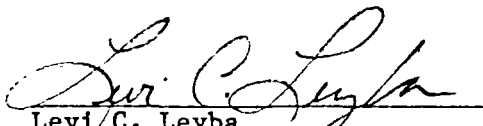TO: Earl Arlin

ANACONDA CONFIDENTIAL DRAFT

The specific activity used in the calculations of uranium natural injected into the disposal well was defined as 3.33×10^{-7} curies per gram U. This factor was based upon the specific activity for mixtures of U-238, U-235, and U-234.

In April of 1980, the specific activity for uranium natural was defined as 6.77×10^{-7} curies per gram U as outlined in the EID Radiation Protection Regulations, (Part 4, Appendix A).

Attached are copies of the regulatory guidelines that discuss the SA of uranium.

As of May, 1980, Anaconda's Environmental Department started using 6.77×10^{-7} ci/gU to calculate the activity of uranium natural. Attached you will also find conversions using both specific activities for uranium natural.

Levi C. Leyba
ENVIRONMENTAL RADIATION
LAB SUPERVISOR

mls

Attachment

cc: DLR
       File

ENVIRONMENTAL IMPROVEMENT DIVISION

RADIATION PROTECTION
REGULATIONS

GEORGE S. GOLDSTEIN, Ph.D.
Secretary for Health and Environment

LARRY GORDON, M.P.H., M.S.
Deputy Secretary

THOMAS E. BACA, M.P.H.
Director
Environmental Improvement Division

R A D I A T I O N   P R O T E C T I O N   B U R E A U

Filed April 21, 1980

SPECIFIC ACTIVITY

APPENDIX A (continued)

[1]Soluble (S); Insoluble (I).

[2]"Sub" means that values given are for submersion in a semi-spherical in-finite cloud of airborne material.

[3]These radon concentrations are appropriate for protection from radon-222 combined with its short-lived daughters. Alternatively, the value in Table I may be replaced by 1/3 "working level." (A "working level" is defined as any combination of short-lived radon-222 daughters, polonium-218, lead-214, bismuth-214 and polonium-214, in one liter of air, without regard to the degree of equilibrium that will result in the ultimate emission of 1.3×10^5 MeV of alpha particle energy.) The Table II value may be replaced by 1/30 of a "working level." The limit on radon-222 concentrations in re-stricted areas may be based on an annual average.

[4]For soluble mixtures of U-238, U-234 and U-235 in air chemical toxicity may be the limiting factor. If the percent by weight (enrichment) of U-235 is less than 5, the concentration value for a 40-hour workweek, Table I, is 0.2 milligrams uranium per cubic meter of air average. For any enrichment, the product of the average concentration and time of ex-posure during a 40-hour workweek shall not exceed 8×10^{-3} SA uCi-hr/ml, where SA is the specific activity of the uranium inhaled. The concentra-tion value for Table II, is 0.007 milligrams uranium per cubic meter of air. The specific activity for natural uranium is 6.77×10^{-7} curies per gram U. The specific activity for other mixtures of U-238, U-235 and U-234, if not known, shall be:

$$SA = 3.6 \times 10^{-7} \text{ curies/gram U} \qquad \text{U-depleted}$$
$$SA = (0.4 + 0.38 E + 0.0034 E^2) 10^{-6} \qquad E > 0.72$$

where E is the percentage by weight of U-235, expressed as percent.

D.1. ESTIMATED POUNDS U$_3$O$_8$ IN EVAPORATION PONDS IN SOLUTION

GIVEN: Average U$_3$O$_8$ grade = 0.015 grams/liter*

Pump capacity = 960 GPM at 85% operating time availability

Estimated 4 years pumping time**

1,440 minutes per day

3.785 liters/gallon

453.6 grams/pound

CALCULATIONS:

(960 x 1,440 x .85 x 0.015 x 4 x 3.785 x 365) ÷ 453.6 = 214,728 lbs.

Gallons = 960 x .85 x 365 x 4 x 1,440 = 1,715,558,400 gallons

1,715,558,400 x 3.785 x (0.015 ÷ 453.6) = 214,728 lbs. ✓

soluble value

* Not total tail value; only soluble value used.

** Pumping from the Main Tailing Area to the evaporation ponds
started December 22, 1977.